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(54) Apparatus for cleaning and opening fibre material

(57) An apparatus for cleaning and opening fibre material, for example cotton, man-made fibre material and the like, in the form of flocks, comprising a feed device, for example a pair of take-in rollers 1, 2, a pin or needle roller 3 arranged to receive fibre material from the feed device, a clothed roller 5 arranged to receive fibre material from the pin or needle roller and a fibre transport duct arranged to receive fibre material from the clothed roller.

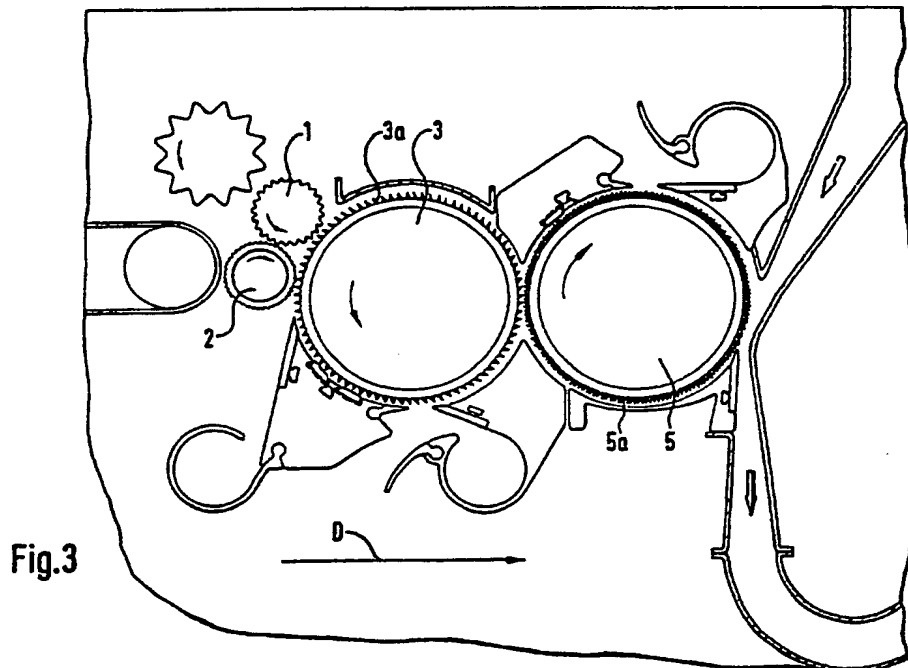


Fig.3

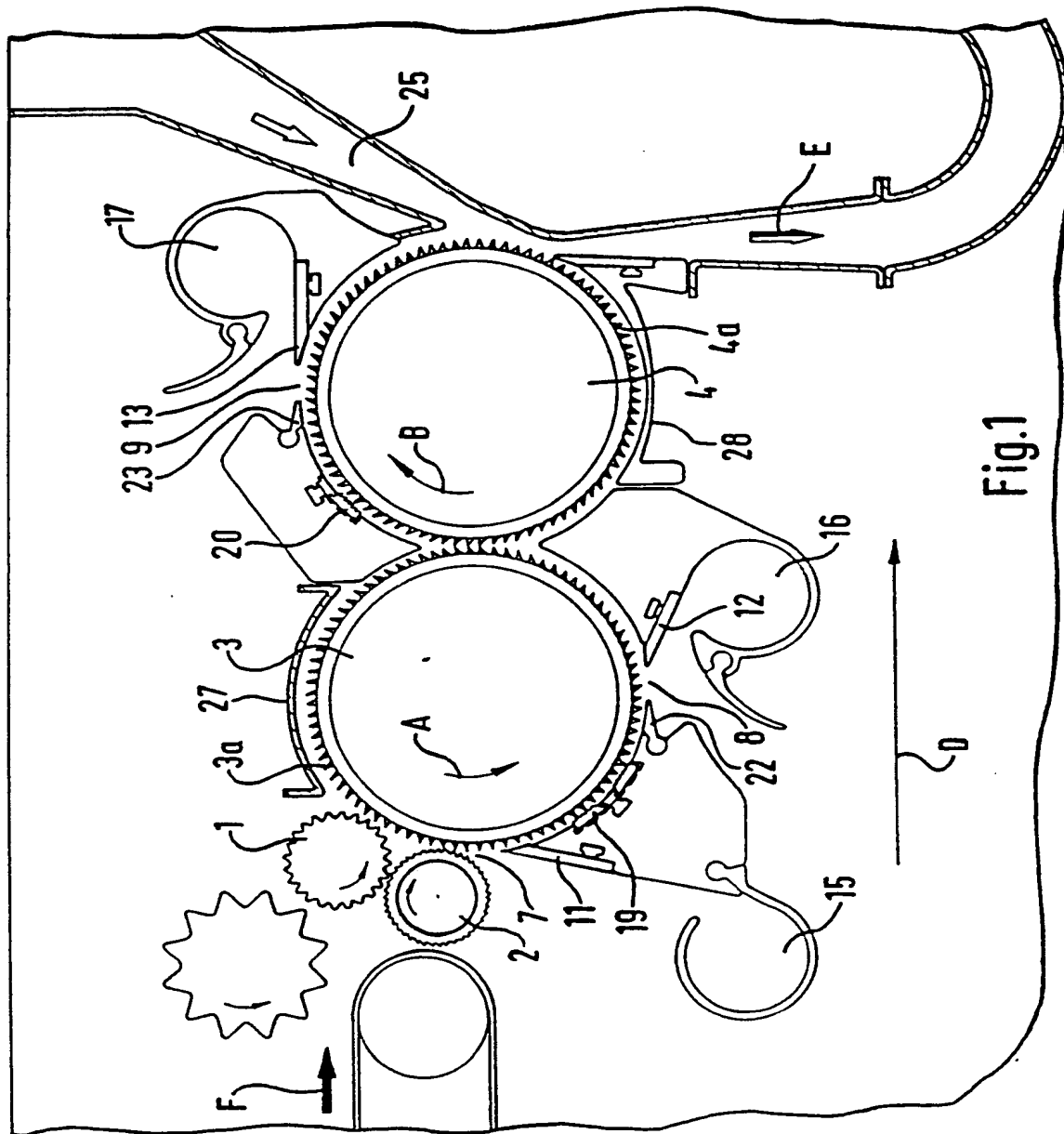
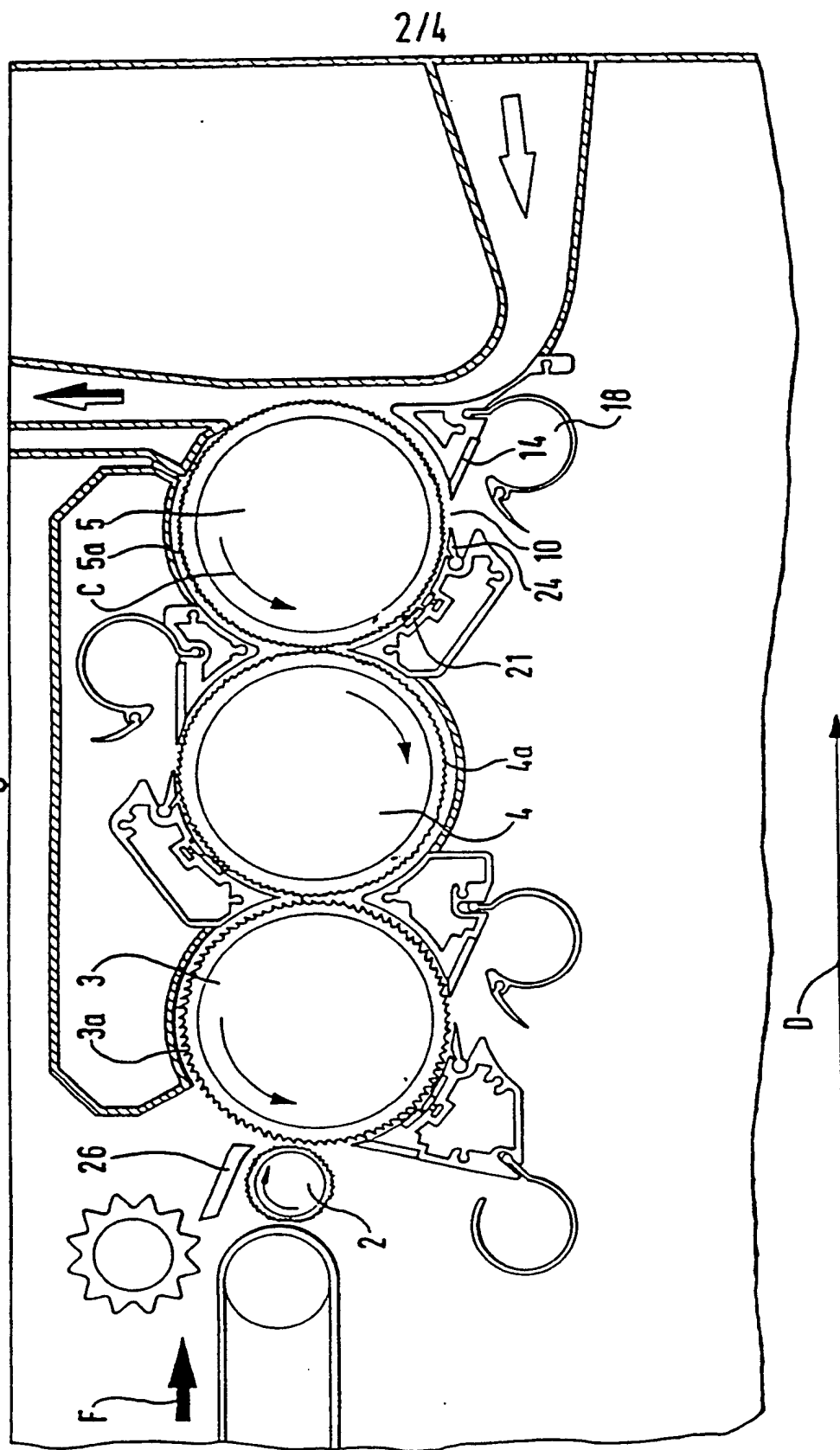


Fig.1

Fig.2



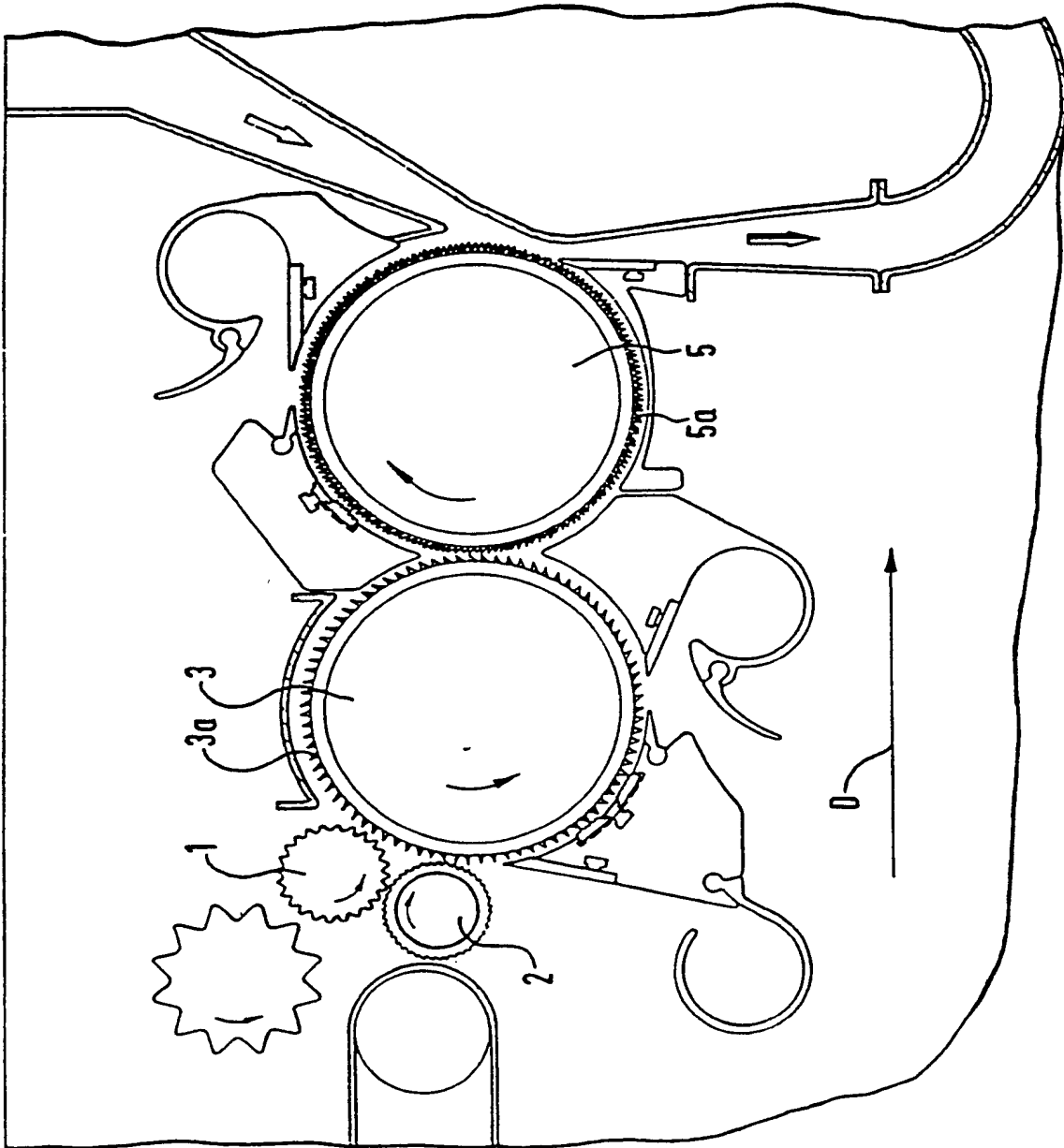
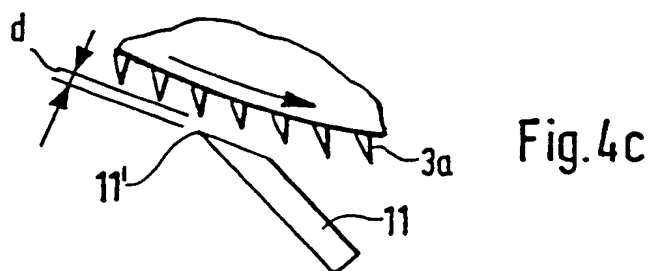
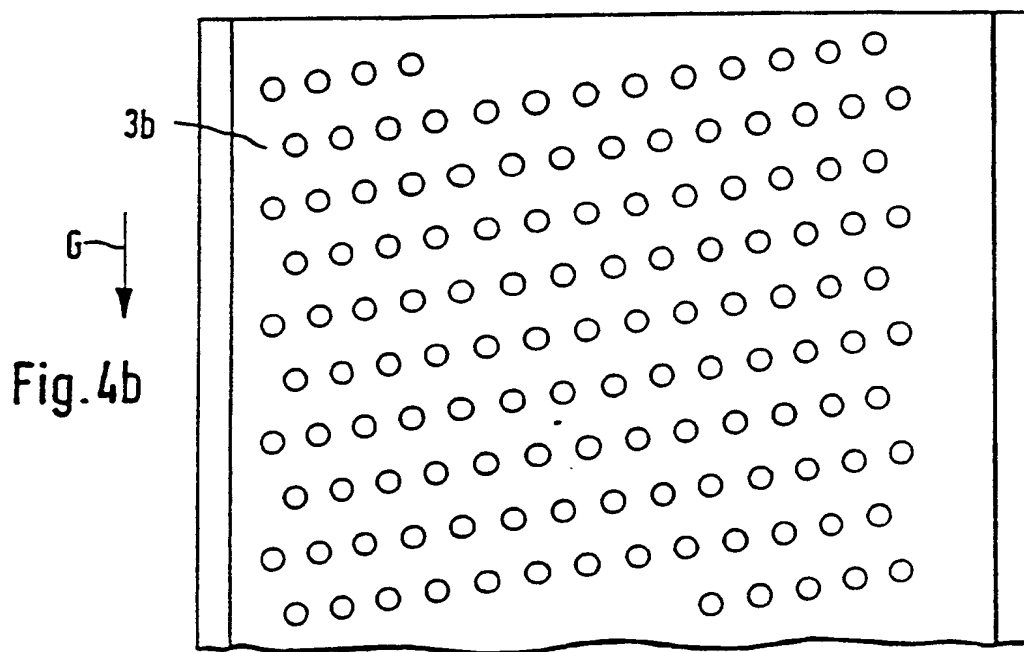
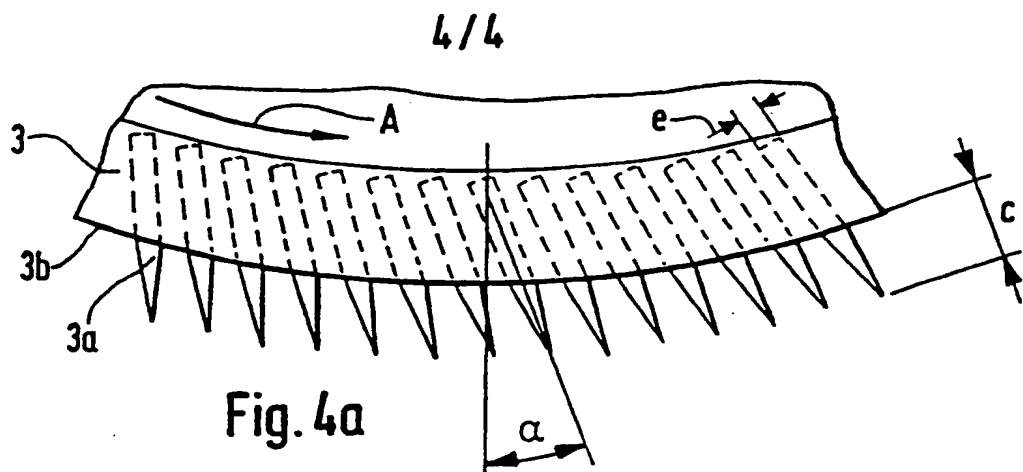


Fig.3



Apparatus for cleaning and opening fibre material

The invention relates to an apparatus for cleaning and opening fibre material, for example, cotton, man-made fibre material and the like, in the form of flocks.

5 In a known cleaning and opening apparatus there is a full pin roller (pin cylinder) which, as an opener roller, cooperates with a grid arranged beneath. The grid surface has a plurality of openings in the form of, for example, holes or narrow slots oriented parallel to
10 the axis of the full pin roller. The grid surface is curved coaxially with respect to the full pin roller and is arranged at a distance from the beating circle of the needles or pins, so that the fibre material is guided over the grid surface. Above the full pin roller, and at
15 a distance therefrom, is a flat, horizontal cover. A pneumatic suction device for removing the fibre material is associated with the full pin roller. The impurities fall through the openings in the grid into a large waste collection chamber. The grid is complicated in terms of
20 production engineering. In addition, the openings in the grid surface may become blocked during operation, especially during the processing of cotton that is contaminated with sticky substances such as honey dew. The cleaning action is impaired as a result. Increasing
25 the circumferential speed of the full pin roller can

result in damage to the fibre owing to the action of the needles on the fibre material, which is being fed slowly, being too aggressive, so that limits are imposed on such an increase.

5 It is an object of the invention to provide an opening and cleaning apparatus that mitigates the above-mentioned disadvantages and which, in particular, permits gentle opening and improved cleaning of the fibre material.

10 The invention provides an apparatus for cleaning and opening fibre material, comprising a take-in device and an opening device arranged for receiving fibre material from the take-in device, the opening device comprising at least two opener rollers, each of which is a pin roller
15 or a needle roller. Thus, in accordance with the invention, fibre material may be fed by a take-in device to a first pin or needle roller and from that roller to a second pin or needle roller downstream of the first roller.

20 The measures according to the invention allow functions to be separated by providing at least two pin or needle rollers downstream of the take-in device. Arranged immediately downstream of the take-in device is a pin or needle roller, the pins or needles of which comb
25 the fibre material. Arranged immediately downstream of the first pin or needle roller is a second pin or needle roller which receives the fibre material from the first

pin or needle roller. The use of two or more pin or
needle rollers enables enhanced cleaning to be obtained.
In use of the apparatus of the invention it is partic-
ularly advantageous for the circumferential speed of the
5 second (downstream) pin or needle roller to be greater
than that of the first pin or needle roller. Then,
fibre material is fed from the take-in device to the
first pin or needle roller, which is rotating relatively
slowly, and the material is combed by the pins or needs
10 of that roller without causing undesired damage to the
fibres. Having already undergone acceleration during
its passage about the first roller, the fibre material is
passed to the second pin or needle roller. The second
pin roller rotates at a higher circumferential speed than
15 does the first pin or needle roller, increased cleaning
of the fibre material thus being carried out. A thorough
cleaning is also carried out at the first pin or needle
roller. In this manner the fibre material undergoes a
gradual acceleration, while being treated gently.
20 Opening of the fibre takes place in stages and is
therefore gentle, and at the same time a markedly
increased cleaning action is achieved by the provision of
two cleaning rollers, in conjunction with the increase in
the circumferential speed of the second pin or needle
25 roller.

A pin or needle roller is advantageously arranged
immediately downstream of the take-in device. A saw-

tooth clothed roller is preferably arranged downstream of the pin or needle rollers. In that case a single high-speed saw-tooth roller may be provided. The rollers, including the saw-toothed roller, if present, are advantageously arranged one behind the other. The downstream roller preferably cooperates with the upstream roller as a take-off and opener roller. Advantageously, the pins or needles are inclined in the direction of rotation with respect to a radial direction of the pin or needle roller. The height of the pins or needles above the part of the roller surface to which they are fixed is preferably approximately from 4 to 20 mm. Advantageously, the pins or needles on the downstream pin or needle roller are shorter than the pins or needles on the upstream pin or needle roller. Preferably, the pins or needles are arranged on the surface of the rollers or of a supporting body in a density of approximately from 0.5 to 2 pins or needles per cm^2 . The density of the pins or needles per cm^2 on the downstream pin or needle roller is advantageously greater than the density of the pins or needles on the upstream pin or needle roller. The diameter of each roller is preferably the same. Further, the diameter of the saw-tooth clothed roller, if present, is preferably the same as that of the pin or needle rollers. Advantageously, the direction of rotation of the downstream pin or needle roller is contrary to the direction of rotation of the upstream pin

or needle roller. The circumferential speed of the downstream roller is preferably greater than the circumferential speed of the upstream roller. Advantageously, at least one clothed fixed carding element is associated with each roller. Each roller preferably has at least one associated separating edge for impurities, for example, a stripping knife, having an associated separating opening. The distance between the knife edge of the stripping knife and the enveloping surface for the free ends of the pins or needles is advantageously approximately from 0.5 to 5 mm. A guide element is preferably arranged in front of the separating edge of the separating knife, the distance between the guide element and the pin or needle roller being adjustable. A tangential suction device for removing the stream of fibre material may advantageously be arranged at the last pin or needle roller in the working direction. If a saw-tooth clothed roller is provided downstream of the pin or needle rollers, a tangential suction device may advantageously be arranged at the said clothed roller. There is preferably at least one curved cover surface above the pin or needle roller. There is advantageously at least one curved cover surface beneath the pin or needle roller.

The invention includes a further preferred apparatus for cleaning and opening fibre material, for example cotton, man-made fibre material and the like, in the form

of flocks, in which the fibre material passes through a take-in device, for example a take-in roller cooperating with a tray, or a pair of take-in rollers, and then through an opening device, for example an opener roller (pin or needle roller), having a cleaning apparatus and is subsequently conveyed to a processing machine, in which apparatus a clothed saw-tooth roller is arranged downstream of the pin or needle roller. A pneumatic fibre flock suction device is preferably associated with the saw-tooth roller.

If a saw-tooth clothed roller is present, the teeth of the said roller advantageously point in the direction of rotation of the said roller.

Certain illustrative embodiments of the invention will be discussed in detail below with reference to the accompanying drawings, of which:

Figure 1 is a diagrammatic side view of an apparatus according to the invention having two cooperating full pin rollers;

Figure 2 is a diagrammatic side view of an apparatus having two full pin rollers with a saw-tooth roller downstream thereof;

Figure 3 is a diagrammatic side view of an apparatus having one full pin roller with a saw-tooth roller downstream thereof;

Figure 4a is a diagrammatic side view of the arrangement

of the pins on a portion of a full pin roller;
Figure 4b is a plan view of a portion of the surface of
the full pin roller shown in Figure 4a; and
Figure 4c shows a separating knife associated with the
pins of a full pin roller.

5

With reference to Figure 1, the fibre material to be
cleaned (arrow F), which may especially be cotton, is fed
in the form of flocks to the cleaning apparatus, for
example, a cleaning apparatus of the type sold by
10 Trützschler GmbH & Co. K.G. under the trademark
Trützschler RST, which is arranged in a closed housing.
Feeding of the fibre material is effected, for example,
through a filling shaft, (which is not shown) and/or by
means of a conveyor belt or the like. The lap is fed by
15 means of two feed rollers 1, 2, while being clamped, to a
pin roller 3 which is rotatably mounted in the housing
and revolves counter-clockwise when viewed from the side
of the apparatus that is shown in Figure 1 (arrow A).
Downstream of the pin roller 3 there is arranged a pin
20 roller 4 which rotates clockwise when viewed from the
side of the apparatus that is shown in Figure 1 (arrow
B). The roller 3 has a circumferential speed of approxi-
mately from 10 to 21 m/sec. The roller 4 has a circum-
ferential speed of approximately from 15 to 25 m/sec.
25 The rollers 3 and 4 have a diameter of approximately from
150 to 300 mm. The pin roller 3 is enclosed at the top

by the housing 27. Associated with the pin roller 3 is a separating opening 7 through which fibre impurities pass, the size of the opening 7 being adapted, or adaptable, to the degree of contamination of the cotton. A separating edge 11, for example a knife, is associated with the separating opening 7. A further separating opening 8 and a separating edge 12 are additionally provided on the roller 3 downstream of the opening 7 in the direction of the arrow A. Associated with the pin roller 4 are a separating opening 9 and a separating edge 13. Each separating edge (for example, knife) has an associated separating hood. D denotes the working direction of the cleaner.

The apparatus functions as follows: The speeds of the rollers 3 and 4 are so chosen that the circumferential speed of the downstream roller 4 is greater than that of the upstream roller 3. The lap consisting of fibre flocks F is fed by the feed rollers 1, 2, while being clamped, to the pin roller 3, which combs the fibre material and takes up fibre tufts on its pins 3a. As the roller 3 passes the separating opening 7 and the separating edge 11, according to the circumferential speed and the curvature of that roller, and the size of the separating opening 7, which may be so selected that it is appropriate to this first separation step, short fibres and coarse impurities are tossed out of the fibre material as a result of the centrifugal forces and, after

passing through the separating opening 7, enter a suction hood 15 for collecting dirt in the housing. The fibre material pre-cleaned in this manner is taken from the first roller 3 by the tips of the needles 4a of the pin roller 4, the circumferential speed of which is greater than that of the roller 3, thus being opened further. As the roller 4 passes the separating opening 9 with the separating edge 13, further impurities are tossed out of the fibre sliver owing to the centrifugal force which is greater at the periphery of the roller 4 than at the periphery of the roller 3.

In the arrangement of Figure 2, a clothed saw-tooth roller 5 is arranged downstream of the pin roller 4, which saw-tooth roller 5 rotates in the direction indicated by the arrow C. 5a denotes the clothing of the endless saw-tooth wire. The feed apparatus consists of the feed roller 2, which rotates slowly, and a feed table 26 cooperating therewith.

Figure 3 shows a cleaning and opening apparatus in which a clothed saw-tooth roller 5 is arranged downstream of a full pin roller 3.

With reference to Figures 1 to 3, the reference numerals 15, 16, 17 and 18 denote suction hoods by means of which the impurities passing through the separating openings 7, 8, 9 and 10, respectively, are removed by suction. The directions of rotation A, B and C of adjacent rollers, that is, in Figure 1 of rollers 3 and

4, in Figure 2 of rollers 3 and 4 and of rollers 4 and 5, and in Figure 3 of rollers 3 and 5, are different. At the end of the last roller in the working direction D there is provided a pneumatic fibre flock suction device 25 for the fibre material E. The circumferential speed of each roller located immediately downstream of another roller in the working direction D is greater than the circumferential speed of the roller that is located immediately upstream. 19, 20 and 21 denote clothed fixed carding elements. 22, 23 and 24 denote guide elements, the distance between the guide elements 22, 23 and 24 and the rollers 3, 4 and 5, respectively, being adjustable.

In the embodiment according to Figure 1 no saw-tooth roller is arranged downstream of the pin rollers 3 and 4.

Figure 4a shows a segment-shaped portion of the outer surface of the full pin roller 3 of Figures 1 to 3, a plurality of pins 3a being fixed to the outer surface 3b of the pin roller 3. The pins 3a, which are pointed at one end, are inclined in the direction of rotation A at an angle α , for example from 15 to 25°, with respect to the radius of the pin roller 3. The height c of the pins 3a above the surface 3b to which they are fastened is, for example, from 4 to 20 mm. e denotes the diameter of the pins 3a, for example from 2 to 4 mm, which are preferably made of steel. As shown in Figure 4b the pins 3a are spaced from one another. The pins 3a are arranged on the surface 3b in a density of approx-

imately from 0.5 to 2 pins per cm^2 . (The lower limit of 0.5 is of a statistical nature and relates to the number of needles, not to the needles as such, which are present only as full needles. 0.5 pins per cm^2 , 1 pin per 2 cm^2 .) G denotes the axial direction of the pin roller 3. Figure 4c shows a portion of the circumference of the roller 3 and a separating knife 11, the edge 11' of the separating knife being spaced by distance d from the enveloping surface for the free ends of the pins 3a. The distance d between the knife edge 11 and the enveloping surface for the free ends of the pins 3a is from 0.5 to 5 mm.

Claims

1. An opening and cleaning apparatus for fibre material comprising a feed device, a pin or needle roller arranged to receive fibre material from the feed device,
5 a clothed roller arranged to receive fibre material from the pin or needle roller and a fibre transport duct arranged to receive fibre material from the clothed roller.

2. An apparatus according to claim 1, wherein the
10 clothed roller is a saw-tooth clothed roller.

3. An apparatus according to claim 1 or claim 2, wherein the pin or needle roller is arranged immediately downstream of the feed device.

4. An apparatus according to any one of claims 1 to
15 3, wherein the rollers are arranged one behind the other.

5. An apparatus according to any one of claims 1 to 4, wherein the pin or needle roller and the clothed roller downstream thereof are so arranged that the clothed roller cooperates with the pin or needle roller
20 as a take-off and opener roller.

6. An apparatus according to any one of claims 1 to 5, wherein the pins or needles of the pin or needle roller are inclined in the direction of rotation with respect to the radius of the pin or needle roller.

25 7. An apparatus according to any one of claims 1 to

6, wherein the height of the pins or needles above that part of the roller surface to which they are fastened is approximately from 4 to 20 mm.

8. An apparatus according to any one of claims 1 to 5 7, wherein the pins or needles are arranged on the surface of the roller or of a supporting body provided on the roller in a density of from 0.5 to 2 pins or needles per cm².

9. An apparatus according to any one of claims 1 to 10 8, wherein the diameter of the clothed roller is the same as that of the pin or needle roller.

10. An apparatus according to any one of claims 1 to 9, wherein the direction of rotation of the pin or needle roller is contrary to the direction of rotation of 15 the clothed roller.

11. An apparatus according to any one of claims 1 to 10, wherein at least one clothed fixed carding element is associated with each roller.

12. An apparatus according to any one of claims 1 20 to 11, wherein each roller has at least one associated separating means having a separating edge for impurities and an associated separating opening.

13. An apparatus according to claim 12, wherein the distance between the separating edge of the 25 separating means and the enveloping surface for the free ends of the pins or needles is from 0.5 to 5 mm.

14. An apparatus according to claim 12 or claim 13,

wherein a guide element is arranged in front of the separating edge of the separating means, the distance between the guide element and the roller being adjustable.

5 15. An apparatus according to any one of claims 1 to 14, wherein there is at least one curved cover surface above a roller.

10 16. An apparatus according to any one of claims 1 to 15, wherein there is at least one curved cover surface beneath a roller.

 17. An apparatus according to any one of claims 2 to 16, wherein the teeth of the saw-tooth clothing point in the direction of rotation of the saw-tooth roller.

15 18. An apparatus substantially as described herein with reference to and as illustrated by Figure 3.

 19. An apparatus according to claim 18, that includes a pin roller substantially as described herein with reference to and as illustrated by Figures 4a, 4b and 4c.

Amendments to the claims have been filed as follows

Claims

1. An opening and cleaning apparatus for fibre material comprising a feed device, a pin or needle roller arranged to receive fibre material from the feed device,
5 a saw-tooth clothed roller arranged to receive fibre material from the pin or needle roller and a fibre transport duct arranged to receive fibre material from the clothed roller.

10 2. An apparatus according to claim 1, wherein the pin or needle roller is arranged immediately downstream of the feed device.

3. An apparatus according to claim 1 or claim 2, wherein the rollers are arranged one behind the other.

15 4. An apparatus according to any one of claims 1 to 3, wherein the pin or needle roller and the clothed roller downstream thereof are so arranged that the clothed roller cooperates with the pin or needle roller as a take-off and opener roller.

20 5. An apparatus according to any one of claims 1 to 4, wherein the pins or needles of the pin or needle roller are inclined in the direction of rotation with respect to the radius of the pin or needle roller.

25 6. An apparatus according to any one of claims 1 to 5, wherein the height of the pins or needles above that part of the roller surface to which they are fastened is

approximately from 4 to 20 mm.

7. An apparatus according to any one of claims 1 to 6, wherein the pins or needles are arranged on the surface of the roller or of a supporting body provided on the roller in a density of from 0.5 to 2 pins or needles per cm².

8. An apparatus according to any one of claims 1 to 7, wherein the diameter of the clothed roller is the same as that of the pin or needle roller.

9. An apparatus according to any one of claims 1 to 8, wherein the direction of rotation of the pin or needle roller is contrary to the direction of rotation of the clothed roller.

10. An apparatus according to any one of claims 1 to 9, wherein at least one clothed fixed carding element is associated with each roller.

11. An apparatus according to any one of claims 1 to 10, wherein each roller has at least one associated separating means having a separating edge for impurities and an associated separating opening.

12. An apparatus according to claim 11, wherein the distance between the separating edge of the separating means and the enveloping surface for the free ends of the pins or needles is from 0.5 to 5 mm.

13. An apparatus according to claim 11 or claim 12,

wherein a guide element is arranged in front of the separating edge of the separating means, the distance between the guide element and the roller being adjustable.

5 14. An apparatus according to any one of claims 1 to 13, wherein there is at least one curved cover surface above a roller.

10 15. An apparatus according to any one of claims 1 to 14, wherein there is at least one curved cover surface beneath a roller.

16. An apparatus according to any one of claims 1 to 15, wherein the teeth of the saw-tooth clothing point in the direction of rotation of the saw-tooth roller.

15 17. An apparatus substantially as described herein with reference to and as illustrated by Figure 1.

18. An apparatus according to claim 17, that includes a pin roller substantially as described herein with reference to and as illustrated by Figures 2a, 2b and 2c.

Patents Act 1977
Examiner's report to the Comptroller under Section 17
(The Search report) 18

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Relevant Technical Fields

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(ii) Int Cl (Ed.6) D01G 9/00, 9/06, 9/08, 9/12, 9/14, 9/16, 9/18

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MR M SIDDIQUE

Date of completion of Search
5 APRIL 1995

Databases (see below)

(i) UK Patent Office collections of GB, EP, WO and US patent specifications.

(ii) ONLINE DATABASES: WPI

Documents considered relevant following a search in respect of Claims :-
1-18

Categories of documents

- | | |
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| <p>X: Document indicating lack of novelty or of inventive step.</p> <p>Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.</p> <p>A: Document indicating technological background and/or state of the art.</p> | <p>P: Document published on or after the declared priority date but before the filing date of the present application.</p> <p>E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.</p> <p>&: Member of the same patent family; corresponding document.</p> |
|--|---|

Category	Identity of document and relevant passages		Relevant to claim(s)
X	GB 2240995 A	(TRÜTZSCHLER) feed device 3a, 3b, 2 etc; pin roller 39, saw-toothed rollers 4-6, fibre transport device 23, page 7 lines 21/22; page 12 lines 18-21, 25-27; page 13 lines 4-6, 14-18	1-5, 8-11 15 at least
A	GB 1530769	(SCHUBERT & SALZER) feed device 20/21; pin rollers 22, 23; cloth roller 5 etc	1

Databases: The UK Patent Office database comprises classified collections of GB, EP, WO and US patent specifications as outlined periodically in the Official Journal (Patents). The on-line databases considered for search are also listed periodically in the Official Journal (Patents).

